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TECHNICAL REPORT

72-13-FL

STUDY OF THE USE OF A CORN FLAKE CRUMB MATRIX FOR CORN FLAKE BAR, SURVIVAL TYPE

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Project Reference: 728012-12

August 1971

UNITED STATES ARMY
NATICK LABORATORIES
Natick, Massachusetts 01760

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Foreword

Compressed dehydrated foods offer significant reduction in volume and weight. Moreover, they can be designed to provide a high caloric value per unit volume and are convenient. The fruit-flavored corn flake bar has been used for many years as a component of operational rations and survival food packets where these factors are most critical.

The major emphasis of this study was to reduce the cost of this component of food packets without sacrificing acceptability and/or storage stability.

The report covers applied research in connection with the possible substitution of a corn flake crumb matrix for pulverized sugar-coated corn flakes in the fruit-flavored survival bar. The work was performed under Project 728012-12.

Mention of tradenames in this report does not constitute an official endorsement or approval of the product by the Department of the Army.

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Abstract

The purpose of this study was to determine whether corn flake crumbs could replace part or all of the sugar-coated corn flakes used to produce compressed fruit-flavored corn flake bars. (For further information on these products see military specification MIL-C-35074.)

By substituting corn flake crumbs for pulverized sugar-coated corn flakes considerable savings could be realized. For example, based on purchases of 12 million long range patrol packets by the Armed Forces in FY70, of which one quarter contain corn flake bars as a component, at least $60,000 could have been saved.

Simple as this sounds, the corn flake crumbs (in bar form) would require comparable storage stability as the pulverized flakes and be able to be compressed to a similar hardness level without brittleness. Test samples were compressed at 2612 pounds per square inch, stored for 9 months at 100°F., and hardness and work measured periodically. In this study it was found that the Instron Universal Testing Apparatus provided objective textural data on corn flake bars heretofore not obtainable by other methods.

Results indicated that compressed fruit-flavored corn flake bars prepared from corn flake crumbs were as stable from a sensory and textural standpoint as those prepared from pulverized corn flakes. However, on increased compression pressures, the use of corn flake crumbs resulted in bars that were more brittle. Further research must be done to determine if this problem of increased brittleness associated with the use of corn flake crumbs can be overcome.

Introduction

Compressed foods which can be eaten "out of hand" like an apple are important in feeding the combat soldier in operational and contingency feeding situations. Unlike the apple, they do not spoil as readily and within limits, can be modified to provide defined nutrient requirements.

Other food items that have been developed are cereal premixed, compressed (MIL-C-3483) and 9 non-reversibly compressed intermediate moisture fruit bars by Rahman *et al* (1971).

This study was concerned with the fruit-flavored corn flake bar survival-type (Type III, MIL-C-35074) which is used mainly in the long range patrol packets. It is offered in either orange or lemon flavors in 2 of the 8 different menus. Other minor uses for these bars are components of Ration, Individual, Trail, Frigid; Food Packet Survival, General Purpose; and Food Packet, Survival, Abandon Aircraft.

Experimental Procedure

Phase I

Materials

Food ingredients used during the course of these studies were corn flakes, sugar-frosted corn flakes, and corn flake crumbs.[1] Other essential ingredients were 100 hour shortening, egg albumen, lemon flavor, and water.

Before premixing, the corn flakes were pulverized by passing them through a No. 2 round screen in a Fitz mill. This produced a powder finer than the crumbs. To adjust for proper sweetness, it was found that sugar-frosted flakes contained 34% sucrose while the plain corn flakes contained 4.2% dry basis (6,7). The difference called for about 30% added sugar, but this level of sugar produced a bar that tasted too sweet. Therefore, the sugar content was lowered to 24% on a weight to weight basis in the finished product. Confectioner's sugar was preferred over granulated sugar because of its more rapid solubility and less "grainy" mouthfeel.

The bars were formulated as shown in Table 1.

Premixing

Shortening and other ingredients were thoroughly mixed, then water and flavor were added and remixed an additional 15 minutes. The product changes to a darker color when shortening is thoroughly dispersed. Product was then stored at -20°F. until compressed (less than 2 days).

Compression

Approximately 43 grams of product were compressed in the Denison HydrOilic Multipress to a bar approximately 1 x 3 x 3/4" with rounded corners. Two bars were produced simultaneously using an instrument reading of 1900 psig which corresponds to 2612 psi.

Storage

Samples were packed in air in hermetically sealed 603 x 700 cans and withdrawn at 0, 3, 6 and 9 months at 100°F. and 6 and 9 months at room temperature (70°F).

[1] Products were obtained from Kelloggs, Battle Creek, Michigan.

Table I. Formulae of Corn Flake Bars

Ingredients	A	B	C
		% by weight	
Sugar-frosted Flakes	71	–	–
Sugar, confectioner's	–	24	24
Corn Flakes	–	47	–
Corn Flake Crumbs	–	–	47
Shortening[1] (100 A.O.M.)	18	18	18
Egg Albumen[2]	7	7	7
Flavor, lemon[3]	2	2	2
Water	2	2	2
Totals	100	100	100

1 Derived from cottonseed oil, produced by Humko

2 Henningsen Foods

3 Perma Stabil ® Sunkist

Sensory Evaluation

Sensory evaluations of product quality were conducted by 12 technologists who were familiar with the product. Evaluations for color, flavor, odor, texture and appearance were made on each bar. The Pilgrim and Peryam (1958) method was used, which has a quality rating scale ranging from 1 (extremely poor) to 9 (excellent).

Texture (Hardness & Chewiness)

The Instron Universal Testing Apparatus, Floor Model TT-DM with a 500 kg. cell was used to determine texture of the corn flake bars which had been brought to room temperature before testing. The samples were penetrated to 50% of initial thickness using a speed of 2 cm/min. and a cylindrical 10 mm punch. Duplicate readings were made at opposite ends of the bar. Results are expressed in maximum force or hardness at 50% penetration in kilograms, and work (chewiness) at 50% penetration in centimeter-kilograms.

Statistics

The experimental data were analyzed statistically by using precut tapes on the Mathatron. Differences between means were determined using Duncan's Multiple Range and Multiple F Tests (3). Any means underscored by a line are not significant while those not underscored are significant.

Phase II

Formulae

The same formulae (A, B, & C) were used to make these bars except that the compression pressures during production were varied. It should be emphasized that the same materials obtained earlier (9 Mos. old) were used as the cereal portion of the bars. These had been stored at room temperature which ranged between 70° and 80°F.

Compression

42 grams of premix were placed in a Carver hydraulic laboratory press and pressure was applied at 2000, 2300, 2500 and 3000 psi. (See Figure 1). Cereal bars were produced that measured nominal 1" x 3" x 3/4".

Texture

Five bars of each treatment were run in duplicate on the Instron as before. Ten total readings for force and work were charted simultaneously.

Statistics

The same statistical treatment as in Phase I was followed.

Results and Discussion

A. Hardness of Corn Flake Bars

Table 2 shows maximum force (hardness) values of corn flake bars withdrawn at 0, 3, 6 and 9 months. Data indicate that none of the corn flake bar samples differed significantly from one another initially as to hardness or force reading in kilograms, except for the commercial bar. This was found to be about twice as hard as the pilot produced formulae.

Storage at 100°F. for 3 months had a marked effect on hardness depending primarily on what cornflake formula was used initially. The samples stored at 100°F. for 3 months were significantly different from one another and demonstrated a reduction in hardness compared with data obtained at start of the test – 0 months, table 2. Softening on a percentage basis was highest for the corn flake crumbs plus sugar (-18.65%) lowest for the sugar-frosted corn flakes (-6.25%) while the corn flakes plus sugar was intermediate (-13.12%).

Analysis of corn flake bars by the Instron after storage for 6 months at room temperature and 100°F. indicated that there were no consistent changes for hardness as was noticed from the period 0 to 3 months, except for the crumb formula where hardness tended to increase. The samples stored at room temperature for 6 months were much harder than those stored at 100°F. The reason for this change in texture of the bars could be due to moisture loss of the product; however, this aspect was beyond the scope of the study. In Table 2 it can be readily seen that all samples differed significantly from one another except for the corn flake crumbs which showed no difference between ambient and 100°F. storage after 6 months.

Table 2 data show after storage for 9 months at 100°F., that the sugar-frosted corn flake and corn flake bars increased in hardness in contrast to the corn flake crumbs plus sugar bars which decreased. It is interesting to note that the cornflake crumb formula was hardest after 6 months at 100°F. and then began to soften. B & C samples held at 100°F. for 9 months were becoming harder, although not as firm as the samples held at room temperature for 6 months. Analysis of variance indicated that the sugar-frosted corn flakes were significantly different or less hard than either corn flake crumbs plus sugar or the corn flakes plus sugar formula. There was no difference between the latter two treatments.

B. Chewiness of Corn Flake Bars

Table 3 shows the work required for each cereal bar formula after 0, 3, 6 and 9 months at 100°F. and 6 months at room temperature. Work as charted on the Instron appears to be related to chewiness. In this case the formula consisting of corn flake crumbs and sugar did not differ significantly from the commercial Pillsbury bar but the sugar-frosted corn flake bar and corn flakes plus sugar differed significantly from each other ($p = .05$) and from the commercial product.

Table 2. Force (hardness) Values of Corn Flake Bars at 0, 3, 6 and 9 Months

Force in Kilograms [1]

		Formula [3]			
Months	Temp.	A	B	C	Commercial [4]
0	----	3.39	4.06	4.79[2]	8.84
3	100°F	3.18	3.53	3.90	not stored
6	100°F.	3.13	3.59	4.92	" "
6	R.T.	4.30	4.35	5.13	" "
9	100°F.	3.69	4.28	4.42	" "

[1] Average of 10 values.

[2] The line under treatment means is used to designate no significance and will appear as such throughout this report. All samples were different (p = .05) when no line appears under values.

[3] Formula A = sugar-frosted flakes, pulverized.
Formula B = corn flakes, pulverized plus sugar.
Formula C = corn flakes crumbs plus sugar.

[4] Pillsbury Co., ~~Minneapolis~~, Minneapolis, Minn.

Table 3. Work (chewiness) Values of Corn Flake Bars at 0, 3, 6 and 9 Months

Work in Centimeter - kilograms[1]

Months	Temp.	Formula[2] A	B	C	Commercial[3]
0	-----	.57	.80	.96	1.07
3	100°F.	.57	.66	.85	not stored
6	100°F	.48	.79	.93	" "
6	R.T.	.66	.78	1.10	" "
9	100°F	.64	.78	.88	" "

[1] Average of 10 values.

[2] Formula A = sugar-frosted flakes, pulverized.
Formula B = corn flakes, pulverized plus sugar.
Formula C = corn flake crumbs plus sugar.

[3] Pillsbury Co., Minneapolis, Minn.

All treatments stored for 3 months at 100°F. were significantly different from one another as to work or chewiness. Sugar-frosted corn flakes were found to remain nearly comparable in chewiness (0.35% difference), while both corn flakes plus sugar and corn flake crumbs plus sugar were less chewy (-16.69 and -10.93% respectively).

Comparison of samples stored for 6 months at room temperature and 100°F. indicated that there were significant differences between all of the samples, except for corn flakes plus sugar. In this latter case, there was no significant difference between these two samples. Corn flake crumbs plus sugar had more chewiness than any of the other samples while sugar-frosted flakes ~~possed~~ possessed the least. The sugar-frosted flake and corn flake crumbs plus sugar showed increased chewiness when stored for 6 months at room temperature; however, the corn flakes plus sugar samples remained constant. Sugar-frosted flakes showed a large loss of chewiness (-16.67%) from their original texture. The other samples showed only minor changes, ranging from 1.12 to 2.7%.

C. Sensory Evaluation of Corn Flake Bars

Table 4 shows sensory evaluation of the three corn flake bars at various withdrawal periods. This table shows the technical panel ratings for color, odor, flavor, texture and appearance. Scale values range from 1-poor to 9-excellent.

For color, all treatments were comparable, with little or no color change recognizable after 9 months storage at 100°F. It is interesting to note that the B formula containing corn flakes plus sugar initially was significantly poorer than samples A or C; however; after storage there were no differences.

The data show that odor scores declined steadily over the 9 month storage period at 100°F. The corn flake crumb formula appeared to be more stable than either sample A or B when bars were held at 100°F. but there was no difference when cereal bars were held for a comparable period at room temperature. Poorer odor scores in samples held at 100°F. than those held at room temperature suggest that the shortening in those samples held at the higher temperature were producing unsaturated aldehydes. The latter volatilize readily after prolonged storage at high temperature to produce off odors.

Flavor for all treatments was not significantly different from one another when analyzed by formula at each withdrawal period. It was found, however, that flavor of samples stored at room temperature was rated significantly better than those samples stored at 100°F. for all treatments. This indicates higher temperatures adversely affect the flavor quality of the corn flake bars but apparently storage at room temperature for 9 months had little or no noticeable affect.

Neither texture nor appearance changes were perceptible to the panel throughout the study although differences were noted in the Instron values. This indicates that the Instron can detect textural changes not apparent to a trained panel.

Table 4. Sensory Evaluation of Corn Flake Bars at 0, 3, 6 and 9 Months by 12 Member Technical Panel

		Color Formula [1]			Odor Formula			Flavor Formula			Texture Formula			Appearance Formula		
Months	Temp.	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
0	--	7.08	6.75*	7	7	6.75	6.75	6.33	6	6.58	5.75	5.83	5.92	6.92	6.75	7
3	100° F.	7	7.08	6.91	6.66	6.83	6.75	6.66	6.33	6.91	5.5	5.66	5.75	7	7	6.91
6	100° F	6.6	6.6	6.6	5.33*	5.92	5.83	5.08	5.6	5.6	5.6	5.6	5.6	6.5	6.6	6.6
6	R.T.	6.75	6.6	6.75	6.3	6.3	6.3	6.5*	6.6*	6.5*	5.6	5.5	5.6	6.6	6.5	6.6
9	100° F.	7	6.9	6.9	5*	4.66*	6.3	5.16	4.8	5.3	6	5.9	6.16	7	6.9	7
9	R.T.	7	7	6.9	6.25	6.5	5.58	6.4	6.4	6.4	6	6.08	6.25	7	7	7

Color Odor Flavor Texture Appearance									
Sample Number	Extremely Poor 1	Very Poor 2	Poor 3	Below Fair Above Poor 4	Fair 5	Below Good Above Fair 6	Good 7	Very Good 8	Excellent 9 [2]

[1] A = sugar-frosted flakes
B = corn flakes plus sugar
C = corn flake crumbs plus sugar
[2] See *Literature Cited*, Pilgrim *et al.*
* Significant difference 5% level

D. Effect of Process Pressure on Cereal Bars

Phase II was a factorial design in which the 9 month old original cereal materials were used to produce the corn flake bars. The bars were compressed to as high as 3000 psi (see figure 1). In this test it was possible to determine the effect of pressure and formula on thickness, hardness and chewability.

It should be emphasized at this point that there is an apparent discrepancy between Phase I and II (see Tables 2 & 3 and 6 & 7). For example, both force and work values for the products produced near the same pressure (2612 psi for phase I and 2500 psi for phase II) during processing do not agree. The reason for this difference is not presently clear. There is a possibility that storage of the raw materials at room temperature (9 months) before phase II was conducted had an effect; plus possible differences in compression equipment (Denison automatic in phase I versus Carver hydraulic press). These discrepancies, however, require further research before any definite conclusions can be reached from these hypotheses.

Table 5 shows the effect of compression pressures on thickness (in centimeters measured by Instron) of corn flake bars. Analysis of variance of data indicated that pressure had a significant effect on thickness. For example, bars produced from sample A (sugar-frosted flakes at 2000 psi) were significantly thicker than those made at higher compression pressures (P_2, P_3 or P_4) of A formula.

Table 6 shows hardness data from textural measurements of corn flake bars using an Instron. Bars were compressed at different pressures, e.g., 2000 psi, 2300~~0~~ psi 2500 psi, and 3000 psi. Analysis of variance indicated that varying the pressure of processing had a significant effect on texture of the cereal bars. Multiple range testing of the statistical means of pressure P_1 (2000 psi) versus P_2 (2300 psi) versus P_3 (2500 psi versus P_4 (3000 psi) indicated that the application of increased pressure during processing produced a more firmly textured bar with products made from sugar-frosted flakes and corn flakes plus sugar than products made with corn flake crumbs. Conversely, increased pressure in some cases decreased the firmness of the cereal bars. This effect was particularly evident in the formula with corn flake crumbs.

Formula means differed significantly from one another. That is, increasing the process compression force increased the hardness of the cereal bar as measured by the Instron. Obviously, P_4 or 3000 psi produced on the average, harder bars than P_3 or 2500 psi, or P_2 etc.

Corn flakes times pressure interaction means were grouped ranging from lowest to highest force values for the application of the multiple range test. It was found that the crumbs plus sugar formula at 2000 psi was the least firm, and sugar-frosted flakes compressed at 3000 psi the most firm.

Figure 1. Experimental Design (Schematic -- Phase 2)

Corn Flakes

Compression Pressure (PSI)	Sugar Frosted (A)	Plus Sugar (B)	Crumbs Plus Sugar (C)
2000 P_1	+	+	+
2300 P_2	+	+	+
2500 P_3	+	+	+
3000 P_4	+	+	+

\+ Five cereal bars, at two penetrations per bar, were tested using the Instron Universal Testing Apparatus.

Table 5. Thickness (expressed in centimeters) of Corn Flake Bars Subjected to Varying Pressures During Compression

	Samples [1]		
Code Pressure	A[2]	B	C
P_1 (2000 psi)	2.044*	1.994	1.994
P_2 (2300 psi)	1.964	1.952	1.968
P_3 (2500 psi)	1.942	1.940	1.978
P_4 (3000 psi)	1.962	1.958	1.968

[1] Average of 10 values.

[2] A = sugar-frosted flakes
B = corn flakes plus sugar
C = corn flake crumbs plus sugar

* Significant difference (p = .05)

Table 6. Maximum Force (hardness, Instron Universal Testing Apparatus) Values of Corn Flake Bars Subjected to Different Pressures During Compression

Maximum Force in Kilograms [1]

Code	Formula A	Formula B	Formula C	Pressure Grand Means
P_1	5.19	5.78	4.45	5.137
P_2	7.21	7.30	5.26	6.588
P_3	9.83	7.15	4.59	7.19
P_4	9.97	9.31	4.70	7.99
Formula Grand Means	8.05	7.38	4.75	

[1] Average of 10 Values

I Formulae

C	B	A
4.75*	7.38*	8.05 *

II Pressures

P_1	P_2	P_3	P_4
5.137*	6.588*	7.19*	7.99*

III Corn flake formula times pressure interactions

C/P_1	C/P_3	C/P_4	A/P_1	C/P_2	B/P_1	B/P_3	A/P_2	B/P_2	B/P_4	A/P_3	A/P_4
4.45	4.59	4.7	5.19	5.26	5.78	7.15	7.21	7.30	9.31	9.83	9.97

* Significant difference (p = .05)

Corn flake crumbs plus sugar at pressures of 2500 psi and 3000 psi were not significantly different from each other. The same was true for corn flakes plus sugar at a pressure of 2500 psi, and sugar-frosted flakes at 2300 psi, and sugar-frosted flakes and corn flakes plus sugar at 2300 psi. All of the other five interaction treatments were significantly different from one another.

Table 7 shows analysis of work on corn flake bars using the Instron. Values are expressed in centimeter-kilograms and are thought to represent "chewiness." The cereal bars formulated with sugar-frosted flakes were found to be more chewy than bars prepared with corn flake crumbs, although there were individual differences depending on the pressure used during processing of the bars. For example the corn flakes plus sugar formula was found to be more chewy than the sugar frosted flakes subjected to processing pressures of 2000 P_1 or 2300 psi P_2, but not at 2500 psi P_3, or 3000 psi P_4.

To find differences among formula grand means the multiple range test was again employed as discussed previously. It was found that the A and B formulae did not differ from each other, but the corn flake crumbs plus sugar sample was significantly different from the other two treatments.

Pressure grand means were grouped ranging from a low of 1.004 for 2000 psi and a high of 1.498 for 3000 psi. Mulitple range analysis of the grand mean values indicated that the bars produced with the lowest pressure during compression were less chewy. For example, P_4 (highest pressure) was more chewy than P_3, which was greater than P_2, which was greater than P_1. There was no significant differences between P_4 and P_3 or between P_2 and P_3. P_1 was significantly different from all pressures, while P_2 was different from P_4.

Interaction mean values of pressure times formula were significant as to work. There were no differences, however, among corn flakes plus sugar compressed at 3000 psi and sugar-frosted flakes compressed at 2500 or 3000 psi. There were no differences between corn flakes plus sugar compressed at 3000 psi and corn flakes plus sugar at both 2500 psi or 2300 psi. No differences were detected between corn flakes plus sugar compressed at 2300 psi or corn flakes plus sugar compressed at 2500 psi or sugar-frosted flakes compressed at 2300 psi or corn flakes plus sugar compressed at 2000 psi.

Sugar-frosted flakes compressed at 2300 psi did not differ from corn flakes plus sugar compressed at 2300 psi. Corn flake crumbs compressed at 2300 psi did not differ significantly from sugar-frosted corn flakes compressed at 2000 psi or corn flake crumbs plus sugar compressed at 3000 psi or corn flake crumbs compressed at 2500 psi. Corn flake crumbs compressed at 2300 psi did not differ from sugar-frosted corn flakes compressed at 2000 psi, or corn flake crumbs compressed at 3000 psi, or 2500 psi and 2000 psi.

All other treatments were significantly different.

Table 7. Work (chewiness, Instron Universal Testing Apparatus) Values of Corn Flake Bars Subjected to Different Pressures During Compression

Work in Centimeter-kilograms [1]

Code	Formula A	Formula B	Formula C	Pressure Grand Means
P_1	.976	1.190	.850	1.004
P_2	1.322	1.419	1.053	1.265
P_3	1.795	1.394	.899	1.363
P_4	1.857	1.677	.961	1.498
Formula Grand Means	1.4873	1.4191	.9408	

[1] Average of 10 values.

I Formulae

C	B	A
.9408	1.4191	1.4873

II Pressures

P_1	P_2	P_3	P_4
1.004	1.265	1.363	1.498

III Corn flake formula time pressure interations

C/P_1	C/P_3	C/P_4	A/P_1	C/P_2	B/P_1	A/P_2	B/P_3	B/P_2	B/P_4	A/P_3	A/P_4
.85	.899	.961	.976	1.053	1.19	1.322	1.394	1.419	1.677	1.795	1.857

Conclusions

A study of corn flake crumbs as a replacement for pulverized sugar-coated corn flakes was made for the corn flake bar, survival type. To obtain comparable sweetness level, it was found that 24% confectioner's sugar had to be added to compensate for the extra sweetness derived from sucrose contained on the sugar-coated corn flakes.

Total replacement of the corn flake formula with crumbs does not appear feasible at this time until further work is carried out on the relationship of particle size to product firmness. Also, it is possible that other binding agents could be used to produce a firmer bar.

Data showed that crumbs are as stable as pulverized flakes from a sensory and textural standpoint but may produce a brittle bar initially when higher pressures are used.

The Instron was found to be a reliable guide for objective textural measurement of this cereal product. Force and work values were charted at a penetration depth of 50% into the cereal bars.

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13. ABSTRACT

The purpose of this study was to determine whether corn flake crumbs could replace part or all of the sugar-coated corn flakes used to produce compressed fruit-flavored corn flake bars. (For further information on these products see military specification MIL-C-35074.)

By substituting corn flake crumbs for pulverized sugar-coated corn flakes considerable savings could be realized. For example, based on purchases of 12 million long range patrol packets by the Armed Forces in FY70, of which one quarter contain corn flake bars as a component, at least $60,000 could have been saved.

Simple as this sounds, the corn flake crumbs (in bar form) would require comparable storage stability as the pulverized flakes and be able to be compressed to a similar hardness level without brittleness. Test samples were compressed at 2612 pounds per square inch, stored for 9 months at 100°F., and hardness and work measured periodically. In this study it was found that the Instron Universal Testing Apparatus provided objective textural data on corn flake bars heretofore not obtainable by other methods.

Results indicated that compressed fruit-flavored corn flake bars prepared from corn flake crumbs were as stable from a sensory and textural standpoint as those prepared from pulverized corn flakes. However, on increased compression pressures, the use of corn flake crumbs resulted in bars that were more brittle. Further research must be done to determine if this problem of increased brittleness associated with the use of corn flake crumbs can be overcome.

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14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Compression	8					
Fabrication	8					
Food bars	2		9			
Corn flakes	1		9			
Fruits	1		9			
Brittleness	[illegible]		8			
Texture			8			
Taste			8			
Storage stability			8			
Pulverized corn flakes			10			
Corn flake crumbs			10			

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